

# 54ACTQ16240

## 16-Bit Inverting Buffer/Line Driver with TRI-STATE® Outputs

### General Description

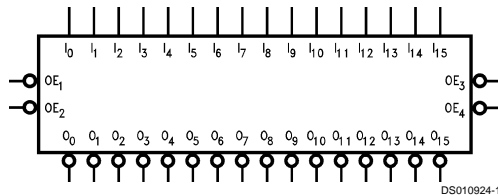
The 'ACTQ16240 contains sixteen inverting buffers with TRI-STATE outputs designed to be employed as a memory and address driver, clock driver, or bus-oriented transmitter/receiver. The device is nibble controlled. Each nibble has separate TRI-STATE control inputs which can be shorted together for full 16-bit operation.

The 'ACTQ16240 utilizes NSC Quiet Series technology to guarantee quiet output switching and improve dynamic threshold performance. FACT Quiet Series™ features GTO™ output control for superior performance.

### Features

- Utilizes NSC FACT Quiet Series technology
- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Separate control logic for each byte
- 16-bit version of the 'ACTQ240
- Outputs source/sink 24 mA
- Standard Microcircuit Drawing (SMD) 5962-9688001

### Logic Symbol

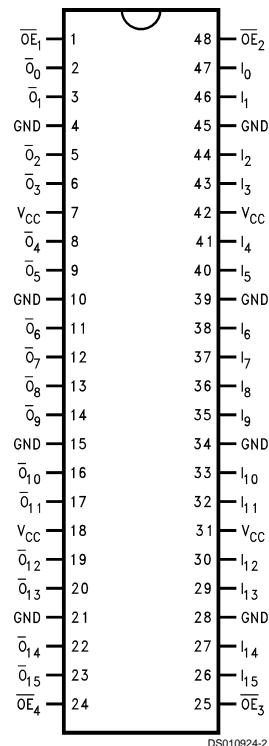


### Pin Description

Pin Names	Description
$\overline{OE}_n$	Output Enable Inputs (Active Low)
$I_0-I_{15}$	Inputs
$\overline{O}_0-\overline{O}_{15}$	Outputs

### Connection Diagram

Pin Assignment for CERPAK



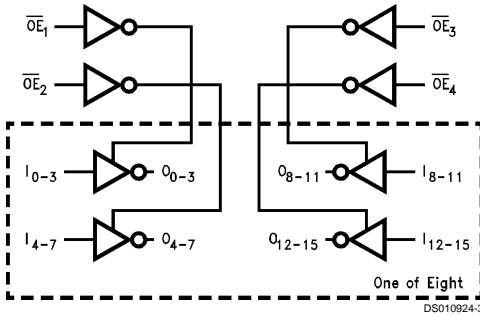
FACT® is a trademark of National Semiconductor Corporation.  
 FACT Quiet Series® is a trademark of National Semiconductor Corporation.  
 GTO® is a trademark of National Semiconductor Corporation.  
 TRI-STATE® is a registered trademark of National Semiconductor Corporation.

## Functional Description

The 'ACTQ16240 contains sixteen inverting buffers with TRI-STATE standard outputs. The device is nibble (4 bits) controlled with each nibble functioning identically, but independent of the other. The control pins may be shorted together to obtain full 16-bit operation. The TRI-STATE outputs

are controlled by an Output Enable ( $\overline{OE}_n$ ) input for each nibble. When  $\overline{OE}_n$  is LOW, the outputs are in 2-state mode. When  $\overline{OE}_n$  is HIGH, the outputs are in the high impedance mode, but this does not interfere with entering new data into the inputs.

## Logic Diagram



## Truth Tables

Inputs		Outputs
$\overline{OE}_1$	$I_0-I_3$	$\overline{O}_0-\overline{O}_3$
L	L	H
L	H	L
H	X	Z

Inputs		Outputs
$\overline{OE}_2$	$I_4-I_7$	$\overline{O}_4-\overline{O}_7$
L	L	H
L	H	L
H	X	Z

Inputs		Outputs
$\overline{OE}_3$	$I_8-I_{11}$	$\overline{O}_8-\overline{O}_{11}$
L	L	H
L	H	L
H	X	Z

Inputs		Outputs
$\overline{OE}_4$	$I_{12}-I_{15}$	$\overline{O}_{12}-\overline{O}_{15}$
L	L	H
L	H	L
H	X	Z

H = High Voltage Level  
 L = Low Voltage Level  
 X = Immaterial  
 Z = High Impedance

## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage ( $V_{CC}$ )	-0.5V to +7.0V
DC Input Diode Current ( $I_{IK}$ )	
$V_I = -0.5V$	-20 mA
$V_I = V_{CC} + 0.5V$	+20 mA
DC Output Diode Current ( $I_{OK}$ )	
$V_O = -0.5V$	-20 mA
$V_O = V_{CC} + 0.5V$	+20 mA
DC Output Voltage ( $V_O$ )	-0.5V to $V_{CC} + 0.5V$
DC Output Source/Sink Current ( $I_O$ )	±50 mA
DC $V_{CC}$ or Ground Current per Output Pin	±50 mA
Junction Temperature CDIP	+175°C
Storage Temperature	-65°C to +150°C

## Recommended Operating Conditions

Supply Voltage ( $V_{CC}$ ) 'ACTQ	4.5V to 5.5V
Input Voltage ( $V_I$ )	0V to $V_{CC}$
Output Voltage ( $V_O$ )	0V to $V_{CC}$
Operating Temperature ( $T_A$ ) 54ACTQ	-55°C to +125°C
Minimum Input Edge Rate (dV/dt) 'ACTQ Devices	125 mV/ns
$V_{IN}$ from 0.8V to 2.0V	
$V_{CC}$ @ 4.5V, 5.5V	

**Note 1:** Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

## DC Electrical Characteristics for 'ACTQ Family Devices

Symbol	Parameter	$V_{CC}$ (V)	54ACTQ	Units	Conditions
			$T_A =$ -55°C to +125°C		
			Guaranteed Limits		
$V_{IH}$	Minimum High Input Voltage	4.5	2.0	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		5.5	2.0		
$V_{IL}$	Maximum Low Input Voltage	4.5	0.8	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		5.5	0.8		
$V_{OH}$	Minimum High Output Voltage	4.5	4.4	V	$I_{OUT} = -50 \mu A$
		5.5	5.4		
		4.5	3.70	V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OH} = -24 mA$ $I_{OH} = -24 mA$
		5.5	4.70		
$V_{OL}$	Maximum Low Output Voltage	4.5	0.1	V	$I_{OUT} = 50 \mu A$
		5.5	0.1		
		4.5	0.50	V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OL} = 24 mA$ $I_{OL} = 24 mA$
		5.5	0.50		
$I_{OZ}$	Maximum TRI-STATE Leakage Current	5.5	±10.0	µA	$V_I = V_{IL}, V_{IH}$ $V_O = V_{CC}, GND$
$I_{IN}$	Maximum Input Leakage Current	5.5	±1.0	µA	$V_I = V_{CC}, GND$
$I_{CCT}$	Maximum $I_{CC}/Input$	5.5	1.6	mA	$V_I = V_{CC} - 2.1V$
$I_{CC}$	Max Quiescent Supply Current	5.5	160.0	µA	$V_{IN} = V_{CC}$ or GND (Note 6)
$I_{OLD}$	Minimum Dynamic Output Current (Note 3)	5.5	50	mA	$V_{OLD} = 1.65V$ Max
$I_{OHD}$			50	mA	$V_{OHD} = 3.85V$ Min

## DC Electrical Characteristics for 'ACTQ Family Devices (Continued)

Symbol	Parameter	V <sub>CC</sub> (V)	54ACTQ		Units	Conditions
			T <sub>A</sub> = -55°C to +125°C			
			Guaranteed Limits			
V <sub>OLP</sub>	Quiet Output Maximum Dynamic V <sub>OL</sub>	5.0	1.2		V	(Notes 4, 5)
V <sub>OLV</sub>	Quiet Output Minimum Dynamic V <sub>OL</sub>	5.0	-1.2		V	(Notes 4, 5)

**Note 2:** All outputs loaded; thresholds associated with output under test.

**Note 3:** Maximum test duration 2.0 ms; one output loaded at a time.

**Note 4:** Maximum number of outputs that can switch simultaneously is n. (n - 1) outputs are switched LOW and one output held LOW.

**Note 5:** Maximum number of outputs that can switch simultaneously is n. (n - 1) outputs are switched HIGH and one output held HIGH.

**Note 6:** I<sub>CC</sub> for 54ACTQ @ 25°C is identical to 74ACTQ @ 25°C.

## AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V) (Note 7)	54ACTQ		Units
			T <sub>A</sub> = -55°C to +125°C C <sub>L</sub> = 50 pF		
			Min	Max	
t <sub>PLH</sub>	Propagation Delay Data to Output	5.0	2.5	9.0	ns
t <sub>PHL</sub>			2.5	8.0	
t <sub>PZH</sub>	Output Enable Time	5.0	2.5	8.5	ns
t <sub>PZL</sub>			2.5	8.9	
t <sub>PHZ</sub>	Output Disable Time	5.0	2.0	8.3	ns
t <sub>PLZ</sub>			2.0	8.3	

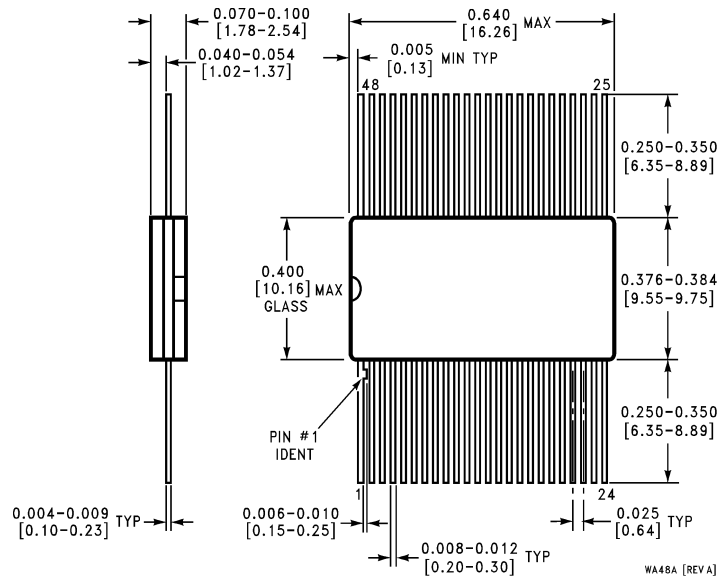
**Note 7:** Voltage Range 5.0 is 5.0V ±0.5V.

## Capacitance

Symbol	Parameter	Typ	Units	Conditions
C <sub>IN</sub>	Input Pin Capacitance	4.5	pF	V <sub>CC</sub> = 5.0V
C <sub>PD</sub>	Power Dissipation Capacitance	95	pF	V <sub>CC</sub> = 5.0V



**Physical Dimensions** inches (millimeters) unless otherwise noted



**48-Lead CERPAK (F)  
 NS Package Number WA48A**

**LIFE SUPPORT POLICY**

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



**National Semiconductor Corporation**  
 Americas  
 Tel: 1-800-272-9959  
 Fax: 1-800-737-7018  
 Email: support@nsc.com

**National Semiconductor Europe**  
 Fax: +49 (0) 1 80-530 85 86  
 Email: europe.support@nsc.com  
 Deutsch Tel: +49 (0) 1 80-530 85 85  
 English Tel: +49 (0) 1 80-532 78 32  
 Français Tel: +49 (0) 1 80-532 93 58  
 Italiano Tel: +49 (0) 1 80-534 16 80

**National Semiconductor Asia Pacific Customer Response Group**  
 Tel: 65-2544466  
 Fax: 65-2504466  
 Email: sea.support@nsc.com

**National Semiconductor Japan Ltd.**  
 Tel: 81-3-5620-6175  
 Fax: 81-3-5620-6179

www.national.com